REMARKS

The Examiner is thanked for the indication that claim 9 is directed to allowable subject matter. Because Applicants believe that the claims from which claim 9 depends are allowable over the cited references, Applicants have not rewritten claim 9 in independent form.

Claims 1-27 are pending. Applicants have amended claims 14, 19, 21, 23, and 25, and have added new claims 28-33. No claims have been cancelled. Accordingly, claims 1-33 are presently pending.

Figure 1 stands objected to as including one or more unlabeled blank boxes that are not well-known components. The figures also stand objected to as having used a reference sign, 2328, that is not mentioned in the description. Applicants have modified Figure 1 and have amended the specification to refer to reference sign 2328. No new matter has been introduced.

The disclosure stands objected to as having used incorrect reference signs on pages 20, 26, and 28. Applicants have amended the specification to address the objection.

Claim 23 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to support the limitation of an "initial condition frequency." Applicants do not concede that "initial condition frequency" lacks support, but to expedite prosecution have amended claim 23 to recite "a center frequency" which finds support in at least page 20, lines 14-29 and page 30, lines 5-29.

Claim 19 stands rejected under 35 U.S.C. § 112, second paragraph, as reciting a limitation, "the slow PLL," that does not have antecedent basis. Claim 20 depends from claim 19 and stands similarly rejected. Applicants have amended claim 19 to address the rejection.

Claims 1, 3-5, 8, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson (4,463,612) in view of Rozenblit et al. (6,466,069) and further in view of Bearcroft (4,446,744). Applicants respectfully submit that these claims are patentable over the cited references. For brevity of argument, Applicants focus on certain deficiencies in Bearcroft.

Regarding Bearcroft, the Office Action states in part that Bearcroft teaches an ultrasonic flowmeter having "two phase locked loops with outputs that can be selectively switched (column 2, lines 55-58)" (at page 6). Applicants disagree. Bearcroft does not describe or suggest at least "two phase locked loops with outputs that can be selectively switched" (Office Action at page 6),

or "a switch operable to switch an output signal of the process variable transmitter between the first output signal and the second output signal" (claim 1). Rather, Bearcroft describes a system in which the outputs of the voltage controlled oscillators ("VCOs") of two phase locked loops are both connected at all times to a mixer in order to determine the difference between the frequencies of the two VCOs. In particular, Bearcroft teaches a first embodiment in which VCOs 20 and 21 are connected to mixer 24 to determine the difference in frequency (col. 2, lines 36-37 and Fig. 1), and a second embodiment in which VCOs 40 and 41 are connected to mixer 46 to determine the difference in frequency (col. 3, lines 25-27 and 31-35). Thus, Bearcroft teaches mixing and does not switch between the outputs of the phase-locked loops.

Additionally, Bearcroft does not describe or suggest at least two phase-locked loops operating on the same input signal. Specifically, Bearcroft does not describe or suggest at least "a first phase-locked loop . . . operable to lock into a frequency of <u>an</u> input signal" and "a second phase-locked loop . . . operable to lock into the frequency of <u>the</u> input signal" (claim 1, emphasis added). Rather, Bearcroft locks into the frequencies of two separate input signals. In particular, Bearcroft describes a first embodiment (Fig. 1) that locks into frequency f_1 of a first signal transmitted by transmitter T_{xa} and locks into frequency f_2 of a second signal transmitted by transmitter T_{xb} (col. 1, lines 60-68). Bearcroft describes a second embodiment (Fig. 2) that locks into the frequency of a first signal that is transmitted by transmitter T_{x1} and locks into the frequency of a second signal that is transmitted by transmitter T_{x2} (col. 2, line 67 – col. 3, line 19). Thus, Bearcroft locks into two signals, and does not lock into an input signal with two phase-locked loops.

The failure of Bearcroft to describe or suggest at least the claimed switch also precludes any motivation to combine Bearcroft with Thompson and Rozenblit et al. Regarding the motivation to combine Bearcroft, the Office Action states in part:

> It would have been obvious . . . to modify the invention of Thompson and Rozenblit to include two phase locked loops rather than just one loop with varying frequencies, as taught by Bearcroft, because the combination would have provided a faster, simpler, method <u>for switching between two different frequency phase locked loop responses</u> and, as suggested by Bearcroft, removed drift effects as well as operated under conditions of rapid changes of density, temperature, and pressure (column 2, lines 55-56, emphasis added).

Applicants respectfully disagree. As discussed above, Bearcroft does not describe or suggest a system for switching between two different frequency phase locked loop responses. Accordingly, because Bearcroft's system does not switch, Bearcroft's system would not be suitable in the vortex flowmeter of Thompson because there is no teaching or suggestion on how to combine the two outputs of Bearcroft to produce the single output of Thompson.

Additionally, the failure of Bearcroft to describe or suggest two phase-locked loops operating on the same input signal also precludes any motivation to combine Bearcroft with Thompson and Rozenblit et al. because Thompson and Rozenblit et al. only have a single input signal, not two input signals as in Bearcroft.

For the foregoing reasons, Applicants therefore submit that a *prima facie* case of obviousness has not been established with respect to claims 1, 3-5, 8, and 13.

Claims 14-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson in view of Rozenblit et al. and Bearcroft and further in view of Vignos et al. (5,576,497). The Office Action states in part that:

> As noted above, Thompson in combination with Rozenblit and Bearcroft teaches all of the features of the claimed invention except for specifying that the vortex flow sensor sense pressure variations due to vortex shedding of a fluid in a passage, converting the pressure variations to a sinusoidal signal, or pre-filtering the signal processing.

Applicants respectfully disagree. Applicants submit that, for the reasons discussed above, Bearcroft does not describe or suggest at least (i) "a switch for switching the output signal generated by the signal processor from among the PLL output signals" and (ii) "phase-locked loops (PLLs) . . . operable to receive the flow sensor signal" (claim 14). Accordingly, Applicants submit that a *prima facie* case of obviousness has not been established with respect to claims 14-20.

Claims 2, 21, 22, and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson in view of Rozenblit et al. and Bearcroft and further in view of Olgaard (6,236,278). The Office Action states in part

> As noted above, Thompson in combination with Rozenblit and Bearcroft teaches all of the features of the claimed invention except for including a lock indicator signal indicating when the phase locked loop is locked.

Applicants respectfully disagree. With respect to claims 21, 22, and 24, Applicants submit that, for the reasons discussed above, Bearcroft does not describe or suggest at least "switching an output of the signal processor between an output signal produced by the first PLL and an output signal produced by the second PLL based on the lock indicator signal," and "locking into the frequency of the input signal using the first PLL" and "the second PLL" (claim 21). Accordingly, Applicants submit that a *prima facie* case of obviousness has not been established with respect to claims 21, 22, and 24. Regarding claim 2, Applicants submit that claim 2 is patentable for the reasons discussed above with respect to claim 1.

Claims 6-7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson in view of Rozenblit et al. and Bearcroft and further in view of Bouillet (6,298,100). Claims 10-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson in view of Rozenblit et al. and Bearcroft and further in view of Henry et al. Applicants submit that claims 6-7 and 10-12, each of which depend from claim 1, are patentable for at least the reasons discussed above with respect to claim 1.

Claims 25-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thompson in view of Rozenblit et al., Bearcroft, and Olgaard, and further in view of Henry et al. (5,570,300). The Office Action states in part:

> Henry teaches self-validating sensors that include a transducer for generating a data signal related to the value of a variable and a transmitter for receiving the data signal and generating output signals, wherein the transmitter generates a first output signal related to the value of the variable and a second output based on a dynamic uncertainty analysis of the first output signal (abstract). Henry also teaches that the uncertainty parameters include a measurement status variable (column 2, lines 17-20) indicating quality (column 7, lines 60-63).
>
> It would have been obvious to one having ordinary skill in the art to modify the invention of Thompson, Rozenblit, Bearcroft, and Olgaard to include specifying that the transmitter include a module for generating uncertainty parameters including a status variable, as taught by Henry, because, as suggested by Henry, the combination would have allowed the user of the sensors to obtain an accuracy measurement of the sensor data since sensors do not perfectly represent the value of a process variable obtained, and often includes effects, such as faults or distortion, resulting from the sensor itself (column 1, lines 20-26).

Applicants respectfully disagree.

Henry et al. do not describe or suggest a self-validating module that is "operable to generate validated uncertainty parameters based on the first lock indicator signal" (claim 25). Rather, Henry et al. describe general equations and principles for generating validated uncertainty parameters (e.g., col. 5, lines 5-62, general equations and principles for generating validated measurement values and validated uncertainties), as well as certain particular implementations. However, Henry et al. do not apply these general equations and principles to the environment of a lock indicator of a phase-locked loop.

It is the Applicants that have applied the self-validating sensor teaching to the environment of a lock indicator of a phase-locked loop (pages 39 and following). Applicants describe, for example, one implementation in which a measurement value and an uncertainty value are determined for a vortex flowmeter (pages 43-44). The determinations depend on which of two PLLs is being used, which in turn is based on lock indicator signals from each PLL (e.g., Fig. 29, elements 2920-2922 and 2928-2932). The implementation also determines a measurement value status based on a unique mapping of lock indicator signals (Table 3). Applicants further provide a propagation rule specific to a vortex flowmeter, determine that the propagation rule requires the determination of the uncertainty of f_i, and teach that "the uncertainty of f_i can be found by estimating the variance of the frequency from the vortex flowmeter" (page 43). Henry et al. do not describe or suggest that a self-validating sensor could use a lock indicator from a phase-locked loop, much less describe or suggest how such a use would be implemented. Accordingly, Applicants submit that their extension of Henry et al. to "a self-validating module operable to generate validated uncertainty parameters based on the first lock signal" (claim 25) is novel and nonobvious.

For the foregoing reasons, Applicants therefore submit that a *prima facie* case of obviousness has not been established with respect to claims 25-27.

Applicants have added new independent claim 32 and submit that claim 32 is patentable over the cited references. In particular, as explained above with respect to claim 25, Henry et al. do not describe or suggest an apparatus with "an input signal related to pressure variations due to vortex shedding of a fluid in a passage," "an output signal related to a flow rate of the fluid in the passage, the output signal being based on the input signal," and "a self-validating module operable to generate validated uncertainty parameters for the output signal" (claim 32).

Applicants disagree with certain of the Office Action's characterizations of the cited references but, for clarity and brevity in argument, have not addressed such characterizations unless required by the line of reasoning in the above arguments. Accordingly, Applicants' silence should not be construed as acquiescing in any of the Office Action's characterizations of the cited references.

In the drawings:

Please amend Figs 1, 3A, and 12 of the drawings in this case as shown in red ink on the attached sheets.

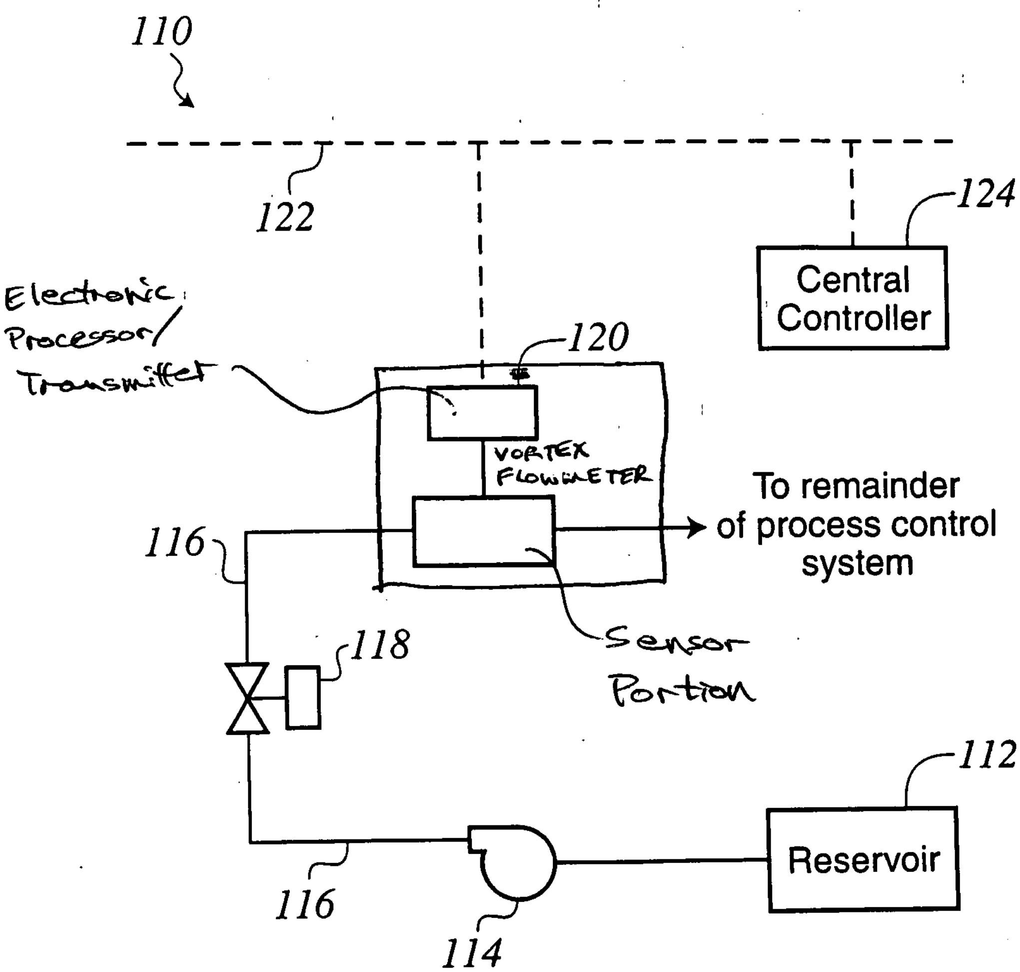
110
122
124
Central Controller
120
Electronic Processor/ Transmitter
VORTEX FLOWMETER
To remainder of process control system
116
118
Sensor Portion
112
Reservoir
116
114

FIG. 1

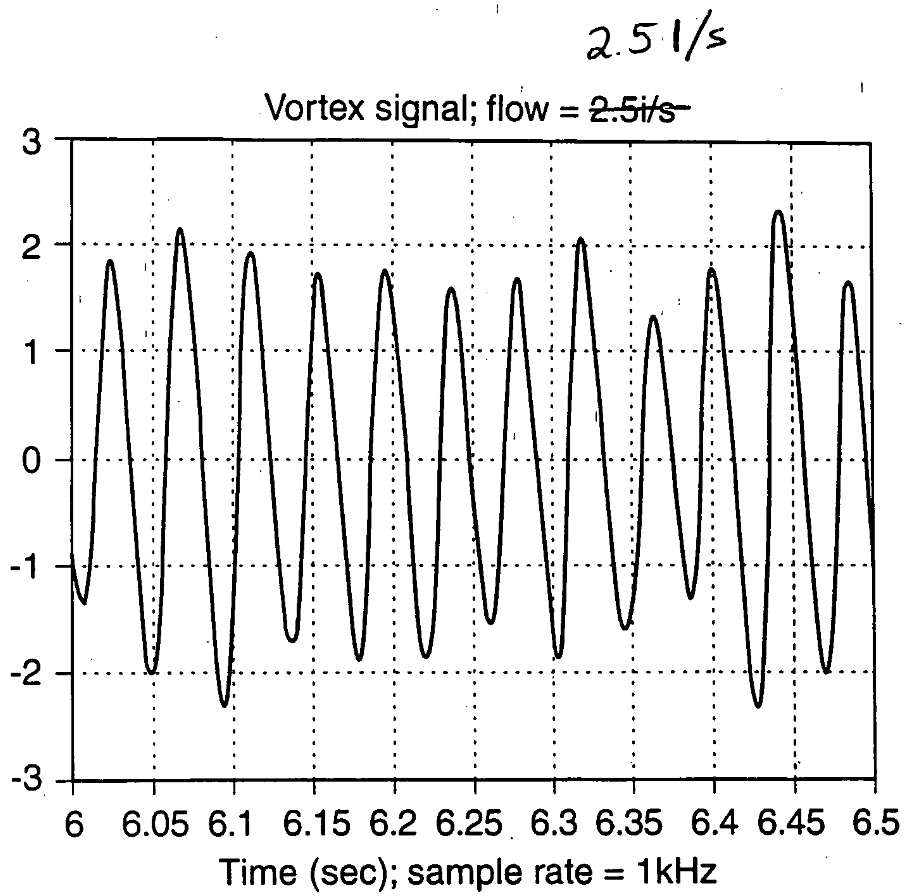
2.5 l/s
Vortex signal; flow = ~~2.5i/s~~
3
2
1
0
-1
-2
-3
6
6.05
6.1
6.15
6.2
6.25
6.3
6.35
6.4
6.45
6.5
Time (sec); sample rate = 1kHz

FIG. 3A

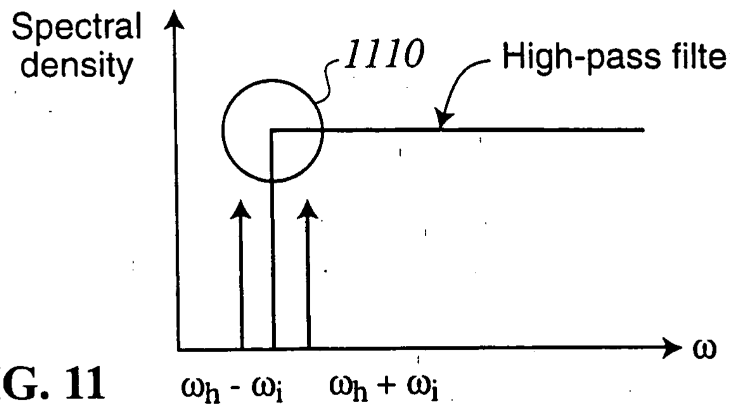

FIG. 11

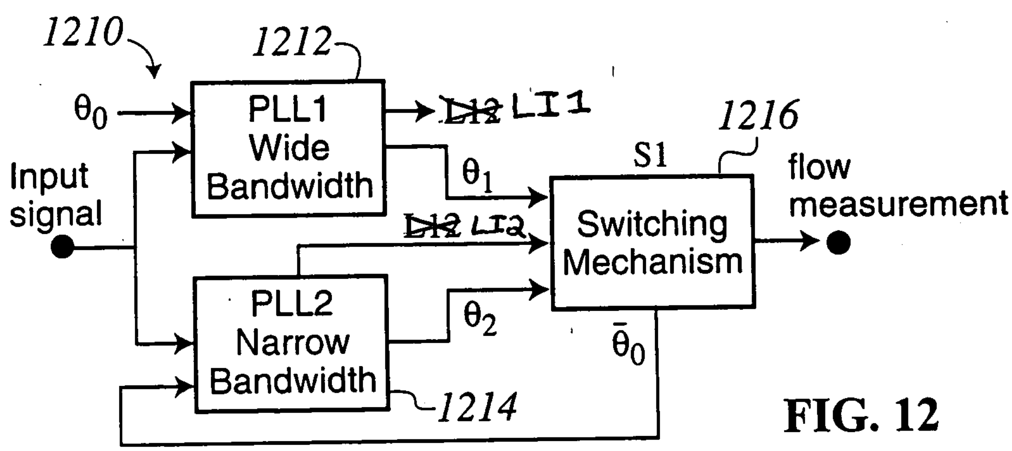

FIG. 12

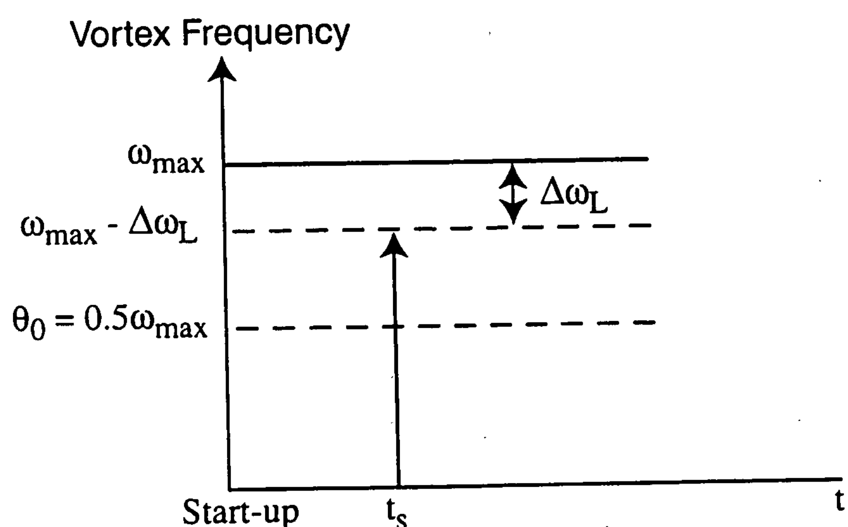

FIG. 13